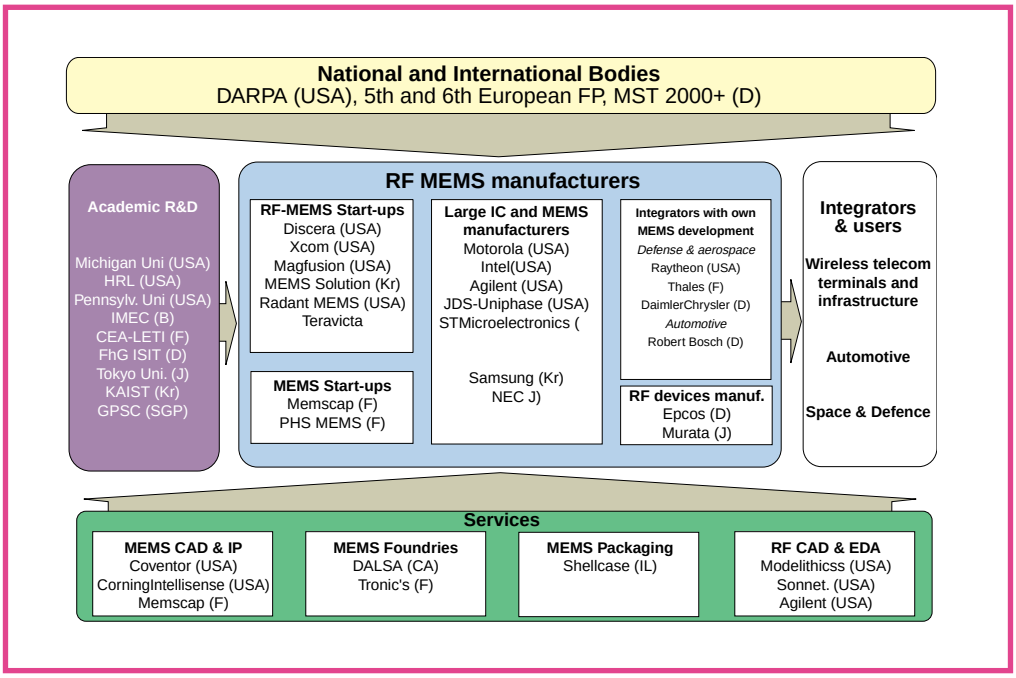
RF MEMS markets



RF MEMS industrial chain main bodies, companies and services

In its September issue, Unaxis *Chip* carries an interesting article on *RF MEMS Analysis, Forecasts and Technology Review.* Authored by Jérémie Bouchard and Dr Henning Wicht of Wicht Technologies Consulting, the feature takes a look at the exciting and important market of RF MEMS.

Defining the subject as micro systems for radio frequency and millimetre wave applications, among which are micro-switches, tunable capacitors, micro-machined inductors, micro-machined antennas, transmission lines and resonators, bulk acoustic wave resonators and cavity resonators, the piece graphically shows the RF MEMS industrial chain main bodies, companies and services - which now exceeds more than 120 organisations and 60 academic research institutions world-wide.

Manufactured using conventional 3D structuring technologies, bulk micro machining, fusion bonding or X-ray lithography, materials used currently include Si, GaAs SiC or SOI substrates. The market forecast for RF MEMS is put at around $100m turnover in 2004, over $200m in 2005 and at over $1bn in 2007.

Implementation potential for RF MEMS at the high end (satellites, military radars, missile systems and test equipment) has fairly decisive advantages, which include base station and anti-collision radars. The volume drivers which require low prices are currently GPS, WLAN and mobile phones.

The authors point out that the challenges to implementation include:

• Proven reliability - despite some MEMS switches at 20bn cycles - it is difficult to carry out accelerated aging tests, and problems like stiction of moving parts often remain unresolved.

• Packaging impacts reliability, performance and price. Wafer level is the most promising as, compared with discrete packaging, it can half the price.

• Pricing will need future manufacturing costs to be calculated.

Anticipating that medium volume, higher price applications, such as auto radars, base stations and instrumentation, are promising for smaller size companies and start ups, the authors note that space and military applications provide interesting niches.

On the issue of hybrid versus monolithic integration, it is a horses for courses route. Hybrid allows optimising the design and manufacture of MEMS independently of the IC, important because of the difference in wafer size (12" compared to 4-6" and manufacturing temperatures, where MEMS can be at 1100°C and CMOS rarely exceeds 350°C. Hybrid is the route for the specialised niche product.

Monolithic integration however is essential for reduced interconnects and mass production, price pressure. High volumes justify complexity. That's a route that MEMS must accommodate for the bulk markets.

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Markets & Business

Endwave steady

Endwave Corp, provider of radio frequency subsystems for carrier-class cellular backhaul infrastructure, broadband wireless networks, and defence systems, reports revenues of $8.2m for 3Q '03, compared with revenues of $8.5 for 2Q '03 and $5m for 3Q '02. Net loss was $735,000, or 8c loss/share, compared to 3Q net loss in '02 of $13.9m, or $1.56 loss/share. Cash and short-term investments at September '03 increased to $28.9m from $28.5m at June.

Revenues at $8.2m increased 65% over the prior year's quarter and exceeded projections of $7-8m. Shipments to non-telecom related 'adjacent' markets comprised 12% of revenues. Products were shipped to 28 clients during the quarter, including 8 new.

Significant clients included Nokia, Stratex Networks and Siemens. 65% of products were manufactured offshore, up from 50% in 2Q of '03. An agreement with Nokia will develop the transceiver for the next-generation radio. Gross margin improved to 28% in the 3Q compared to 27% in 2Q '03. Inventory decreased by $500,000 to $8.2m at September '03, as compared with $8.7m in June.

Uniroyal liquidates

Uniroyal Technology Corp, operating under bankruptcy protection since August '02, will soon be liquidated, according to a SEC filing.

Howard Curd, chairman and CEO of the high tech company, has closed a deal to buy Uniroyal's Wisconsin-based Naugahyde factory. Uniroyal's Optoelectronics division in Tampa, has been sold off "in piece-meal fashion since August 2003." Sterling was sold to Dow Corning for $11.2m in January.